



Pumping Apparatus Operations

Course Plan

Course Details

Certification:	Fire Apparatus Driver/Operator – Pumping Apparatus
CTS Guide:	Fire Apparatus Driver/Operator – Pumping Apparatus (August 2015)
Description:	This course provides information on pumping apparatus preventive maintenance and operations. Topics include routine tests, inspections, and servicing functions; producing hand, master, and foam fire streams, relay pump operations; and supplying water to fire sprinkler and standpipe systems. This course is based on the 2014 edition of <i>NFPA 1002 Standard for Fire Apparatus Driver/Operator Professional Qualifications</i> .
Designed For:	Career and volunteer fire service personnel who drive and operate a fire department pumping apparatus
Prerequisites:	Fire Apparatus Driver/Operator 1A (2008 or 2015 version) Successfully completed OSFM Fire Fighter I Hold a valid Class C Firefighter Endorsed driver's license (minimum)
Standard:	Complete all activities and skills Complete the summative test with a minimum score of 80%
Hours:	Lecture: 16:00 Activities: 1:00 Skills: 22:00 Testing: 1:00
Hours (Total):	40:00
Maximum Class Size:	30
Instructor Level:	This course requires one (1) primary instructor and sufficient assistant instructors to meet the skills ratio
Instructor/Student Ratio:	Lecture: 1:30 Skills: 1:5

Fire Apparatus Driver/Operator 1B

Restrictions: Sufficient fire apparatus and adequate space to accommodate the students in the class and the required skills

SFT Designation: CFSTES

Required Resources

Instructor Resources

To teach this course, instructors need:

- *Fire Apparatus Driver/Operator*, Second Edition, Jones & Bartlett, ISBN-13: 978-1-284-02691-7
- *or*
- *Pumping and Aerial Apparatus Driver/Operator Handbook*, Third Edition, IFSTA, ISBN: 9780879395711
- Maintenance and inspection forms
- Manufacturer's specifications and requirements
- NFPA 13, NFPA 13D, NFPA 13E, NFPA 13R, and NFPA 14

Online Instructor Resources

The following instructor resources are available online at

<http://osfm.fire.ca.gov/training/SFTCurriculum.php>

- Fire Apparatus Driver/Operator 1B: Pumping Apparatus Operations required activities

Student Resources

To participate in this course, students need:

- *Fire Apparatus Driver/Operator*, Second Edition, Jones & Bartlett, ISBN-13: 978-1-284-02691-7
- *or*
- *Pumping and Aerial Apparatus Driver/Operator Handbook*, Third Edition, IFSTA, ISBN: 9780879395711
- Personal protective clothing

Facilities, Equipment, and Personnel

The following facilities, equipment, or personnel are required to deliver this course:

- Standard learning environment or facility
- Writing board or paper conference pads
- Markers, erasers
- Computer or tablet with presentation or other viewing software
- Amplification devices
- Projector and screen
- Sufficient pumping apparatus to accommodate the students in the class

- Tools and equipment for inspection and testing
- Pressurized water source (hydrant or supply line from another pumping apparatus)
- Static water source (drafting pit, portable tank, or natural water source)
- Hard suction hose
- Foam portioning system
- Foam or foam substitute
- Sprinkler system or mockup appliance
- Standpipe system or mockup appliance
- Tools and equipment
- Personal protective clothing
- Adequate space to accommodate the required skills

Unit 1: Introduction

Topic 1-1: Orientation and Administration

Terminal Learning Objective

At the end of this topic, a student will be able to identify facility and classroom requirements and identify course objectives, events, requirements, assignments, activities, resources, evaluation methods, and participation requirements in the course syllabus.

Enabling Learning Objectives

1. Identify facility requirements
 - Restroom locations
 - Food locations
 - Smoking locations
 - Emergency procedures
2. Identify classroom requirements
 - Start and end times
 - Breaks
 - Electronic device policies
 - Special needs and accommodations
 - Other requirements as applicable
3. Review course syllabus
 - Course objectives
 - Calendar of events
 - Course requirements
 - Student evaluation process
 - Assignments
 - Activities
 - Required student resources
 - Class participation requirements

Discussion Questions

1. What is a formative test? What is a summative test?

Activities

1. To be determined by the instructor.

Topic 1-2: Fire Apparatus Driver/Operator – Pumping Apparatus Certification Process

Terminal Learning Objective

At the end of this topic, a student will be able to identify the courses and requirements for the Fire Apparatus Driver/Operator – Pumping Apparatus certification, and be able to describe the certification task book and testing process.

Fire Apparatus Driver/Operator 1B

Enabling Learning Objectives

1. Identify the courses required for Fire Apparatus Driver/Operator – Pumping Apparatus certification
 - Fire Apparatus Driver/Operator 1A: Driver/Operator
 - Fire Apparatus Driver/Operator 1B: Pumping Apparatus Operations
2. Identify any other requirements for certification
 - OSFM certified Fire Fighter I
 - Experience [one (1) of the following two (2) options]
 - Option 1: Have a minimum of one (1) year full-time, paid experience in a California fire department with the primary responsibility as a pumping apparatus driver/operator
 - Option 2: Have a minimum of two (2) years volunteer or part-time, paid experience in a California fire department with the primary responsibility as a pumping apparatus driver/operator
 - Be appointed to the rank or position of Fire Apparatus Driver/Operator
 - Performing in an acting capacity does not qualify
3. Describe the certification task book process
 - Complete all prerequisites and course work
 - Submit application and fees to request certification task book
 - Complete all job performance requirements included in the task book
 - Must have identified evaluator verify individual task completion via signature
 - Must have Fire Chief or authorized representative verify task book completion via signature
 - Must be employed by a California Fire Agency in the position prior to submitting completed task book to State Fire Training
4. Describe the certification testing process
 - Complete course work
 - Schedule online certification test
 - Schedule skills evaluation test

Discussion Questions

1. How many courses are there in the Fire Apparatus Driver/Operator – Pumping Apparatus certification track? What are they?

Activities

1. To be determined by the instructor.

Unit 2: Preventive Maintenance

Topic 2-1: Perform and Document Routine Tests, Inspections, and Servicing Functions Unique to Pumping Apparatus

Terminal Learning Objective

At the end of this topic, a student, given a pumping apparatus, tools and equipment, maintenance and inspection forms, manufacturer's specifications and requirements, and policies and procedures of the jurisdiction, will be able to perform and document routine tests, inspections, and servicing functions on the systems and components unique to a pumping apparatus to verify their operational status.

Enabling Learning Objectives

1. Recognize manufacturer specifications and requirements
2. Review policies and procedures of the jurisdiction, including documentation requirements
3. Describe pumping systems and components
 - Types
 - Positive displacement
 - Centrifugal
 - Single/multi stage
 - Transfer of power
 - Priming systems
 - Pumping systems
 - Foam systems
 - Pressure control devices
 - Gauges
 - Valves and plumbing
 - Water tank and other extinguishing agent levels (if applicable)
 - Steel tanks
 - Aluminum tanks
 - Poly tanks
4. Use tools and equipment
5. Inspect fire pump and components
6. Recognize system problems
7. Correct any deficiency noted according to policies and procedures and/or manufacturer specifications and requirements

Discussion Questions

1. What are the advantages and disadvantages of positive placement and centrifugal pumps?
2. What is the function of the priming system?
3. What are the various ways power can be transferred to the pump?

Activities

1. Have students draw a diagram of a pump and its related plumbing.

CTS Guide Reference: CTS 1-3

Unit 3: Operations

Topic 3-1: Produce an Effective Hand or Master Stream

Terminal Learning Objective

At the end of this topic, a student, given an internal water tank, a pressurized water source, and a static water source, will be able to produce an effective hand or master stream by engaging the pump, setting all pressure control and apparatus safety devices, achieving and maintaining the rate flow of the nozzle, while continuously monitoring the apparatus for potential problems.

Enabling Learning Objectives

1. Explain hydraulic calculations for friction loss and flow using both written formulas and estimation methods
2. Explain pump discharge pressure calculations
3. Discuss proper positioning of a pumping apparatus
 - Hydrant
 - Standpipes
 - Drafting
4. Describe the safe operation of the pump
 - Introduction of water
 - Cavitation
 - Water hammer
 - Overheating
 - Discharge gates
 - Pressure control devices
5. Identify the problems related to small-diameter or dead-end mains
6. Discuss low-pressure and private water supply systems
7. Recognize hydrant coding systems
8. Describe the principles of drafting
9. Discuss the reliability of static sources
10. Position a pumping apparatus to operate at a fire hydrant and at a static water source
11. Power transfer from apparatus engine to pump
12. Draft
13. Operate pumper pressure control systems
14. Operate the volume/pressure transfer valve (multistage pumps only)
15. Operate auxiliary cooling systems
16. Make the transition between internal and external water sources
17. Assemble hose lines, nozzles, valves, and appliances
18. Apply hydraulic calculations to produce an effective stream

Discussion Questions

1. What is the earliest indication of impending cavitation?
2. How does a discharge relief valve operate?

Activities

1. Activity 3-1-1: Produce an Effective Hand or Master Stream

Instructor Note

1. Provide students with precourse material that refreshes their mathematic skills needed for hydraulic calculations

CTS Guide Reference: CTS 2-8

Topic 3-2: Relay Pumping Operation

Terminal Learning Objective

At the end of this topic, a student, given two or more pumping apparatus, a water source, 2½" or larger supply line, and a relay pumping evolution will be able to pump a 2½" or larger supply line to provide the correct pressure and flow to the next pumping apparatus in the relay.

Enabling Learning Objectives

1. Explain the need for relay pumping operations
2. Explain hydraulic calculations for friction loss and flow using both written formulas and estimation methods
3. Explain pump discharge pressure calculations
4. Position a pumping apparatus to operate at a fire hydrant and a static water source
5. Power transfer from pumping apparatus engine to pump
6. Draft
7. Operate pumper pressure control systems
8. Operate the volume/pressure transfer valve (multistage pumps only)
9. Operate auxiliary cooling systems
10. Make the transition between internal and external water sources
11. Assemble hose lines, nozzles, valves, and appliances
12. Apply hydraulic calculations to a relay operation

Discussion Questions

1. What method do you use when calculating your pump discharge pressure for a relay operation?
2. What needs to be considered when pumping to an aerial master stream?
3. In what situations would you use a relay pumping operation?

Activities

1. Activity 3-2-1: Relay Pumping Operation

CTS Guide Reference: CTS 2-9

Topic 3-3: Produce a Foam Fire Stream

Terminal Learning Objective

At the end of this topic, a student, given a pumping apparatus, foam-producing equipment, foam concentrate, and manufacturer's specifications and requirements, will be able to produce a foam fire stream to provide properly proportioned foam.

Enabling Learning Objectives

1. Describe proportioning rates and concentrations
2. Explain equipment and assembly procedures
3. Identify foam system limitations
4. Discuss manufacturer's specifications and requirements
5. Operate foam proportioning equipment
6. Connect foam stream equipment

Discussion Questions

1. In which incidents wouldn't you want to use foam?
2. How do you prime the foam system?
3. What options do you have if your primary system fails?

Activities

1. Activity 3-3-1: Produce a Foam Fire Stream

CTS Guide Reference: CTS 2-10

Topic 3-4: Supply Water to Fire Sprinkler and Standpipe Systems

Terminal Learning Objective

At the end of this topic, a student, given a pumping apparatus, sprinkler and standpipe system, and specific system information, will be able to supply water to fire sprinkler and standpipe systems at the correct volume and pressure.

Enabling Learning Objectives

1. Explain hydraulic calculations for friction loss and flow using both written formulas and estimation methods
2. Explain pump discharge pressure calculations
3. Discuss hose layouts
4. Identify the location of fire department connections
5. Discuss alternative supply procedures if fire department connection is not usable
6. Describe operating principles of sprinkler systems as defined in NFPA 13, NFPA 13D, and NFPA 13R
7. Explain fire department operations in sprinklered properties as defined in NFPA 13E
8. Describe the operating principles of standpipe systems as defined in NFPA 14
9. Position a pumping apparatus to operate at a fire hydrant
10. Power transfer from pumping apparatus engine to pump
11. Operate pumper pressure control systems
12. Operate the volume/pressure transfer valve (multistage pumps only)
13. Operate auxiliary cooling systems
14. Make the transition between internal and external water sources

15. Assemble hose lines, nozzles, valves, and appliances
16. Apply hydraulic calculations to a sprinkler and standpipe systems

Discussion Questions

1. How do your operations differ when supplying a wet versus a dry standpipe?
2. What is your operation when pumping to a high-rise?
3. When should you connect to a sprinkler or standpipe system? How?

Activities

1. Activity 3-4-1: Supply Water to Fire Sprinkler and Standpipe Systems

CTS Guide Reference: CTS 2-11

Fire Apparatus Driver/Operator 1B

Time Table

Segment	Lecture Time	Activity/Skills Time	Total Unit Time
Unit 1: Introduction			
Topic 1-1: Orientation and Administration			
Lecture	0:30		
To be determined by the instructor		0:00	
Topic 1-2: Pumping Apparatus Certification Process			
Lecture	0:30		
To be determined by the instructor		0:00	
Unit 1 Totals	1:00	0:00	1:00
Unit 2: Preventive Maintenance			
Topic 2-1: Perform Routine Tests, Inspections, and Servicing Functions Unique to Pumping Apparatus			
Lecture	3:00		
Recommended by State Fire Training		1:00	
Unit 2 Totals	3:00	1:00	4:00
Unit 3: Operations			
Topic 3-1: Produce an Effective Hand or Master Stream			
Lecture	8:00		
To be determined by the instructor			
Activity 3-1-1: Produce an Effective Hand or Master Stream		*	
Topic 3-2: Relay Pumping Operation			
Lecture	1:00		
To be determined by the instructor			
Activity 3-2-1: Relay Pumping Operation		*	
Topic 3-3: Produce a Foam Fire Stream			
Lecture	1:00		
To be determined by the instructor			
Activity 3-3-1: Produce a Foam Fire Stream		*	
Topic 3-4: Supply Water to Fire Sprinkler and Standpipe Systems			
Lecture	2:00		
To be determined by the instructor			
Activity 3-4-1: Supply Water to Fire Sprinkler and Standpipe Systems		*	

Fire Apparatus Driver/Operator 1B

Segment	Lecture Time	Activity/Skills Time	Total Unit Time
Unit 3 Totals	12:00	22:00	34:00
Lecture, Activity, and Unit Totals:	16:00	23:00	39:00

Course Totals

Total Lecture Time (LT)	16:00
Total Activity Time (AT)	1:00
Total Skills Time (ST)	*22:00
Total Testing Time (TT)	1:00
Total Course Time	40:00

Note: Skills time will vary depending on the number of students in the program. It is important to remember that the suggested skill hours are for 30 students.